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What is the volume (in litres) of oxygen needed for the complete combustion of 10 litres of acetylene at 1500°C and a pressure of 101 kPa assuming temperature and pressure remain constant?

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Meave Gilchrist
B.S. in Bachelor of Science in Biology & Chemistry, University of Texas Pan American (Graduated 1985)
· Author has **6.9K** answers and **5M** answer views · 5y

Use the ideal gas law to calculate the moles of C_2H_2. Then use stoichiometry to calculate the moles of O_2. Then use the ideal gas law again to calculate the volume of O_2

Calculate the moles of C_2H_2.

PV = nRT

Known and Unknown

P = pressure = 101 kPa

V = volume = 10 L

n = ? mol

R = gas constant = 8.31446 L•kPa/K•mol

T = temperature = 1500°C + 273.15 = 1773.15 K

Solve for n.

n = PV/RT

$n(C_2H_2)$ = (101 kPa × 10 L)/(8.31446 L•kPa/K•mol × 1773.15) = 0.068508 mol C_2H_2

Stoichiometry

Balanced equation

$2C_2H_2 + 5O_2 \rightarrow 2H_2O + 4CO_2$

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0.068508 mol C_2H_2 × 5 mol O_2/2 mol C_2H_2 = 0.17127 mol O_2

Use the ideal gas law to calculate the volume of O_2 in 0.17127 mol O_2 under the conditions given.

P = 101 kPa

V =? L

n = 0.17127 mol

R = 8.31446 L•kPa/K•mol

T = 1773.15 K

Solve for V.

V = nRT/P

$V(O_2)$ = (0.17127 mol × 8.31446 L•kPa/K•mol × 1773.15 K)/(101 kPa) = 24.999 mol O_2

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Any integration engineer who has spent weeks staring at nested JSON structures, mismatched date-time formats, or reconciling a multi-line SAP IDoc with a Salesforce endpoint knows that data mapping is where velocity goes to die.

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- Let NLP Handle the Heavy Schema Transformations: Instead of spending hours manually linking hundreds of source-to-target fields or writing complex loops to normalize phone numbers and currencies, teams are letting Natural Language Processing (NLP) do the heavy lifting. Advanced platforms now utilize contextual AI assistants—such as Jitterbit's iPaaS AI Assistants—to auto-map disparate data structures. You describe the transformation in plain English, and the model auto-generates the transformation logic, drastically reducing human error.
- Unify Application Data, EDI, and APIs: Workflow automation becomes infinitely harder when you're hopscotching between different tools for different protocols. If your cloud application integration (iPaaS) is completely separated from your B2B supply chain workflows (EDI), your team ends up managing duplicate data models. Consolidating these into a single, AI-infused control plane like Jitterbit Harmony ensures that whether a payload is coming from an internal API or an external vendor's ANSI X12 document, it's managed through a single console.The goal isn't just to build integrations faster; it's to make them reusable and resilient. According to independent G2 data, organizations that ditch the manual scripting approach in favor of an AI-powered, unified integration ecosystem drop their average deployment time down to just 1.7 months.

If your team is losing sprints to data transformations and endpoint refactoring, it's a clear sign that your middleware needs to evolve past static scripts.

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What is the volume (in liters) of oxygen needed for the complete combustion of 1p litres of acetylene at 1500 degrees Celsius and pressure of 101 kpa assuming temperature and…

At 273 K and 100-atmosphere pressure, the compressibility factor of oxygen is 0.97. What is the mass of oxygen necessary to fill a gas cylinder of 108.5 lit capacities under the given…

What volume would 20.0g of oxygen occupy at a temperature of 25 C and a pressure of 105 kPa?

What pressure would be required to compress 1 mole of oxygen into a 5 litre container held at 100°C?

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Chemical information services (1985–present) · Author has **6.1K** answers and **8.5M** answer views · 3y

Originally Answered: What is the volume (in litres) of oxygen needed for the complete combustion of 10L of acetylene at 1500•c and a pressure of 101kpa assuming temperature and pressure are at STP?

What is the volume (in litres) of oxygen needed for the complete combustion of 10L of acetylene at 1500•c and a pressure of 101kpa assuming temperature and pressure are at STP?

CheeHock Chew's answer is exceedingly complete, detailed … and correct.

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have:

$2\ C_2H_2 + 5\ O_2 \rightarrow 4\ CO_2 + 2\ H_2O$

The nice thing about gas-phase stoichiometry problems is that — when ideal gases are assumed — volume is a perfect stand-in for moles. Regardless of temperature or pressure, the mole ratio is the same as the volume ratio.

So here we know that the mole ratio is 5 O_2 : 2 C_2H_2 (or 2.5:1). Meaning, the volume ratio will be 2.5:1, too.

For 10 L of acetylene, then, you need 25 L of oxygen.

What is not clear, though, is the double sets of T/P values. Are we working at 1500 C/101 kPa, or at STP? If the 10 L volume of acetylene is at the same temperature as the oxygen, then 25 L is our final answer. But if not …

With that “failure to communicate”, I can’t go any further.

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Michael Mombourquette

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Originally Answered: What is the volume (in liters) of oxygen needed for the complete combustion of 1p litres of acetylene at 1500 degrees Celsius and pressure of 101 kpa assuming temperature and pressure remain constant?

What does 1p litres mean? I’ll assume it means 10 litres. The balanced chemical reaction is the first thing you need

$$C_2H_2 + 2.5O_2 \rightarrow 2CO_2 + H_2O$$

Now, T 1500 degrees all these species will be gases and we will assume they behave like ideal gases. Avagadro’s law says the ratios of volume is equal to ratios of moles. Those coefficients in

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So start with 10 L of acetylene and use the mole ratio, ok the volume ratios to convert to oxygen

$$10\ L\ C_2O_2 \times \frac{2.5\ O_2}{1\ C_2O_2} = 25\ L\ O_2$$

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Originally Answered: What is the volume (in liters) of oxygen needed for the complete combustion of 1p litres of acetylene at 1500 degrees Celsius and pressure of 101 kpa assuming temperature and pressure remain constant?

What is the volume (in liters) of oxygen needed for the complete combustion of 1p litres of acetylene at 1500 degrees Celsius and pressure of 101 kpa assuming temperature and pressure remain constant?

(presuming that “1p litres” is a typo for “10 litres”)
Using PV = nRT, rearranged as n = PV/(RT)—and converting 1500 °C to kelvins—we find that the number of moles of acetylene present is

$$\mathrm{n} = \frac{(101\ \mathrm{kPa})(10\ \mathrm{L})}{(8.314\ \mathrm{L{\cdot}kPa/(mol{\cdot}K)} \cdot 1773\ \mathrm{K})} = 0.068\ \mathrm{mol}.$$

Now write the balanced equation for the complete combustion of acetylene:
$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$.
From this you see that 5 mol of O_2 are needed for 2 mol of C_2H_2. Divide the number of moles by 2, to get the multiplier for the 5 mol of O_2: 0.068/2 = 0.034.
5(0.034 mol) = 0.17 mol.

Use PV = nRT again, rearranged as V = nRT/P.

$$\mathrm{V} = \frac{(0.17\ \mathrm{mol})(8.314\ \mathrm{L{\cdot}kPa/(mol{\cdot}K)}) \cdot (1773\ \mathrm{K})}{101\ \mathrm{kPa}} = 24.8\ \mathrm{L}.$$

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Some oxygen gas has a volume of 41.0 L under a pressure of 245 kPa and a temperature of 279 K. What is the mass of the gas?

What is the volume in liters of 0.100 O2 gas at O•c and 2.00 pressure?

A sample of oxygen gas has a volume of 0.0012dm3 at a temperature of 2.0 °C and a pressure of2.4atm. What is the volume and the mass of the sample of gas under room condition?

What volume is occupied by 16 g of oxygen at 273 K and 1 bar pressure?

A cylinder contains 12L of oxygen at 20 degrees C and 15 ATM. The temperature is raised to 35c and the volume is reduced to 8.52L. What is the final pressure of the gas in the…

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Originally Answered: What is the volume (in litres) of oxygen needed for the complete combustion of 10L of acetylene at 1500•c and a pressure of 101kpa assuming temperature and pressure are at STP?

What is the volume (in litres) of oxygen needed for the complete combustion of 10L of acetylene at 1500•c and a pressure of 101kpa assuming temperature and pressure are at STP?

Note:

101 KPa = 0.996792 atm

The balanced equation:

2C2H2 + 5O2 ➡ 4CO2 + 2H2O

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2C2H2 + 5 O2 -> 4CO2 + 2H2O

P = 101 kPa

T = 1773 K

R = 8.314 kPa*L/(K*mol)

VA = 10 L

nA = PVA/RT

nO = nA(5/2) = {PVA/RT}(5/2)

VO = nORT/P ={ PVA/RT}(5/2)}RT/P = 5VA/2 = 25 L

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Originally Answered: What is the volume of O2 required to oxidize 10 litres of acetylene?

5O2 + 2C2H2 -> 4CO2 + 2H20

That means every mole of C2H2 (Acetylene) needs 2.5 mole of oxygen

As volume is directly proportional to the number of moles, we can easily deduce that one litre of acetylene needs 2.5 litre of oxygen. Thus, 10 litre acetylene will need 10 X 2.5 = 25 litre oxygen, if the temperature and pressure are same.

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Originally Answered: What is the volume (in liters) of oxygen needed for the complete combustion of 1p litres of acetylene at 1500 degrees Celsius and pressure of 101 kpa assuming temperature and pressure remain constant?

Well, what is the stoichiometric equation that represents acetylene combustion....?

$$HC\equiv CH(g)+\frac{5}{2}O_2(g)\longrightarrow 2CO_2(g)+H_2O(l)$$

And given old Avogadro's law, ONE volume of acetylene requires two and a half volumes of dioxygen for stoichiometric equivalence...

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Originally Answered: What is the volume of O2 required to oxidize 10 litres of acetylene?

10 litres acetylene is 10/22.4 moles acetylene

Stoichiometry:

H-C=C-H + 5/2O2 → 2CO2 + H2O

5/2 X 10/22.4 X 22.4 = 25 = 25 litres O2 or 1.17 moles O2

No wonder the oxygen tank is 3X times the size the little acetylene tank in a welding kit

Upvote

Well, look at the stoichiometric equation that represents the combustion of acetylene...

$$HC\equiv CH(g)+\frac{5}{2}O_2(g)\longrightarrow 2CO_2(g)+H_2O(l)$$

And so if a $10\bullet L$ volume of acetylene is completely combusted, given the equation are not $25\bullet L$ dioxygen required...? And this gives a $20\bullet L$ volume of carbon dioxide under equivalent conditions... And all we use is Avogadro's gas law, i.e. $V\propto n$ under equivalent conditions of temperature, and pressure...

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Abdul Rehman Amjad
Teaches Chemistry at Spark Academy (SMC Pvt. Ltd) (2018–present) · Author has **353** answers and **260.4K** answer views · 4y

50 cm3 will be the volume of resulting mixture.

10 cm3 of H2 will react with 20cm3 of H2 to form 20 cm3 H2O

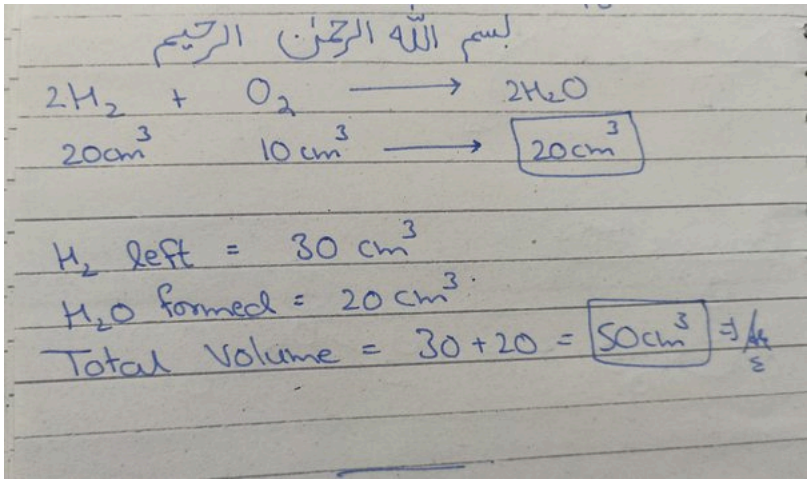
$2H_2 + O_2 \rightarrow 2H_2O$

20cm3 + 10 cm3 → 20 cm3

Water formed = 20cm3

H2 left = 50–20 = 30cm3

Total volume = 50 cm3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$2H_2 + O_2 \rightarrow 2H_2O$
$20cm^3$ $10\,cm^3 \rightarrow 20cm^3$
H_2 left = $30\,cm^3$
H_2O formed = $20\,cm^3$
Total Volume = $30 + 20 = 50cm^3$

5.9K views · View upvotes 1 of 2 answers

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Originally Answered: What is the volume of O2 required to oxidize 10 litres of acetylene?

What is the volume of O2 required to oxidize 10 litres of acetylene? What is the temperature and pressure of the acetylene? And the Oxygen? Without that information, we cannot tell how much of the substance is in the 10 litres but in general, you need five molecules of Oxygen for every two molecules of Acetylene:

5O2 + 2C2H2 = 4CO2 + 2H20

Upvote

Originally Answered: What is the volume (in litres) of oxygen needed for the complete combustion of 10L of acetylene at 1500•c and a pressure of 101kpa assuming temperature and pressure are at STP?

The volume of oxygen required for the complete combustion of 10L of acetylene at 1500•c and a pressure of 101kpa, assuming temperature and pressure are at STP, is 30L.

Related **6 litres of an alkene requires 27L of oxygen at constant temperarure and pressure for complete combustion the alkene is?**

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Engineering Consultant (Owner) (2005–present) · Author has **874** answers and **715.2K** answer views · 6y

Interesting question. An alkene is something like CnH2n and the reaction with oxygen will be:
CnH2n + 1.5n O2 => n CO2 + n H2O

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We have 27/22.4 = 1.205 moles of O2 and 6/22.4 = 0.268 moles of alkene.

So 0.268 moles react with 1.205, therefore 1 mole of alkene will react with 1.05/0.268 = 4.5 moles of O2

Going back to the reaction on line 2, we have 4.5 = 1.5n **and n=3**. Done! Just propene.

EDIT: short cut I should have seen. Per mole of alkene, we have 27/6 = 4.5 moles of O2.

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Ian Campbell
Product Demonstrator at Self-Employment (2018–present) · Author has **85** answers and **185.1K** answer views · 8y

Look at the equation for the reaction. C2H2 + O2 = CO2 + H2O, before balancing. But we need to put numbers in there to balance it out. The two carbons need a total of 4 oxygen atoms to balance them; the two hydrogens need one atom of oxygen. So one molecule of acetylene needs 5 atoms of oxygen for full combustion. Oxygen comes in biatomic molecules O2, so one has to double both sides; the equation comes out to 2C2H2 + 5O2 = 4CO2 +2H2O.

OK, we have the equation. Now, the number of molecules in a volume of gas is directly proportional to the volume; the actual number of molecules is extremely high and also irrelevant. There are 2.5 times as many oxygen molecules in the equation as acetylene, so the volume of oxygen is 2.5 times that of the acetylene. 5x2.5=12.5, so the answer is 12.5cm3.

I thought showing my workings might help a bit more than just giving the answer. :)

Incidentally, this answer is an approximation assuming both reactants are perfect gases, which they are not (no real gas is); but in normal Earth-surface conditions it's a very good one. Probably one part in 1000 or so.

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of CO_2 formed

Anoopa Ann Thomas
M-Tech in Chemical Engineering & Membrane Separations Technology, National Institute of Technology, Calicut (Graduated 2020) · 6y

I have taken certain assumptions to solve this question.

Assumptions

1. The pressure and temperature of acetylene involved is the same as that of oxygen

2. Gases Involved are taken as ideal

With these assumptions, let's see how to solve this problem

The stoichiometric equation representing the combustion of acetylene can be written as.

$2C_2H_2 + 5O_2$ gives $4CO_2+2H_2O$

The number of moles of acetylene,

N =PV/RT=

((1.5*1.01325*10^5)*(200*10^-6))/(8.314*(27+273)) =**0.012187 mol**

P, pressure in Pa

V, volume in m^3

R,universal gas constant (Pa.m^3/mol.K)

T, the temperature in K

according to the stoichiometric expression 2 moles of acetylene reacts (complete combustion) with 5 moles of oxygen to form 4 moles of carbon dioxide and 2 moles of water.

Using this we can find out the number of moles of oxygen required for the complete combustion of 0.012187 moles of acetylene

No of moles of oxygen =0.012187*(5/2) =0.030 mol

The volume of oxygen =NRT/P

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=500cm^3

Volume of CO2 =NRT/P

=(0.024374*8.314*(27+273))/(1.5*1.01325*10^5)

= 3.9999*10^-4

=399.9 cm^3

hope that its clear now.You can follow the same method if the state of reactants are different.

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temperature and pressure?

Christian Edwards
6y

For methane, PV=nRT, n=PV/RT, sub in the values of pressure, volume, gas constant, and temperature to solve for the moles of gas of methane reacting. We know methane and oxygen react in a 1 mole methane : 2 mole oxygen ratio from the balanced equation, so by using ratios, solve for the moles of oxygen reacting, then rearrange the ideal gas law equation to solve for volume.

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Well CH4 + 3O2 = CO2 + 2H2O

So you need 3 molecules of oxygen per molecule of methane.

And volume is proportional to the number of molecules (at a given temperature and pressure)

So you need 30 cm^3 x 3 = 90 cm^3 of oxygen.

Or 90 cm^3 x 100/20 = 450 cm^3 of air.

Related **How much volume of oxygen will be required for complete combustion of 40 ml of acetylene and how much volume of CO2 and H2O will be formed?**

Devender Singh
MSc in Chemistry & Board of High School and Intermediate Education, Uttar Pradesh, Chaudhary Charan Singh University (Graduated 1990) · Author has **926** answers and **3.9M** answer views · 7y

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$$n = \frac{PV}{RT} \qquad K = \frac{P}{RT}$$

$$n = K \times V$$

No. of Mole of gas = K × Volume of gas

let x ml oxygen will be required for complete combustion of 40 ml of acetylene under same temperature and pressure.

$$\underset{40K \text{ mole}}{C_2H_2} + \frac{5}{2}\underset{VK \text{ mole}}{O_{2(g)}} \longrightarrow \underset{V_1K \text{ mole}}{2CO_{2(g)}} + \underset{V_2 \times K \text{ mol}}{H_2O_{(g)}}$$

$$\frac{\text{mole of } C_2H_2}{\text{mole of } O_2 \text{ consume}} = \frac{1}{5/2} = \frac{2}{5}$$

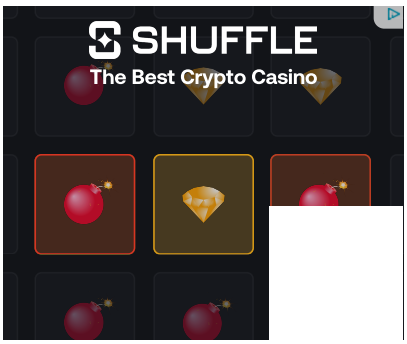
$$\frac{40K}{VK} = \frac{2}{5}$$

$$V = 100 \text{ ml}$$

i.e. 100 ml O_2 is consume.

volume of CO2 is V1 ml and H2O is V2 ml will be formed

$$\underset{40K \text{ mole}}{C_2H_2} + \frac{5}{2}\underset{VK \text{ mole}}{O_{2(g)}} \longrightarrow \underset{V_1K \text{ mole}}{2CO_{2(g)}} + \underset{V_2 \times K \text{ mol}}{H_2O_{(g)}}$$



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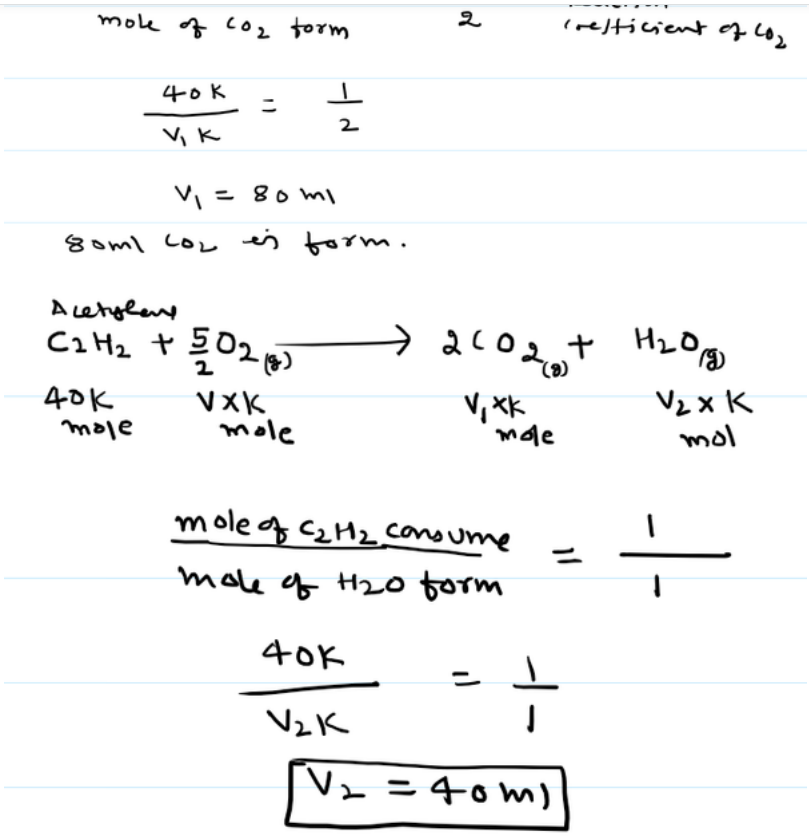

volume of CO2 =80 ml and H2O=40ml will be formed

thankuuuu

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The stoichiometry of the oxidation (or combustion) of acetylene is summerized below. Three conditions are probable viz:

1. Complete combustion

2C2H2 + 5O2 = 2H2O +4CO2

2. Incomplete combustion I

2C2H2 + 3O2 = 2H2O + 4C0

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Guy Clentsmith
Studied Chemistry at The University of British Columbia · Author has **11K** answers and **2M** answer views · Updated 2y

Look at the equation that represents (complete) acetylene combustion…. As always, we balance the carbons as carbon dioxide, the hydrogens as water, and THEN balance the oxygens…

$$HC \equiv CH(g) + \frac{5}{2}O_2(g) \longrightarrow 2CO_2(g) + H_2O(l) + \Delta$$

Given that at the same pressure, and temperature (conditions that we must ASSUME) volume is proportional to the number of moles, to combust completely a $5 \bullet cm^3$, $5 \bullet L$, $5 \bullet m^3$ volume of acetylene, we needs $12.5 \bullet cm^3$, $12.5 \bullet L$, $12.5 \bullet m^3$, volumes of dioxygen gas (of course we need a much greater volume of AIR in each case; why?)… What volumes of carbon dioxide result…?

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the volume to 9.50 L?

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Use the combined gas law.

P1·V1/T1 = P2·V2/T2

P1 = initial pressure = 75 kPa

V1 = initial volume = 10.5 L

T1 = initial temperature = 26°C + 273 K = 299 K (Temperature must be in Kelvins for gas laws.)

P2 = final pressure = 116 kPa

V2 = final volume = 9.50 L

T2 = final temperature = ?

Rearrange the formula to isolate T2. Substitute the known data and solve.

T2 = P2·V2·T1/P1·V1

T2 = (116 kPa·9.50 L·299 K)/(75 kpa·10.5 L) = 418 K

T2 = 418 K - 273 = 145°C = 150°C to two significant figures

Upvote · 2

Ernest Leung
M.Phil. in Chemistry, The Chinese University of Hong Kong · Author has **13.1K** answers and **23.7**… · 1y

According to the Avogadro's law, the volume ratio of gases at constant temperature and pressure is equal to their mole ratio.

Let C_nH_{2n} be the molecular formula of the alkene.

$2\ C_nH_{2n} + 3n\ O_2 \rightarrow 2n\ CO_2 + 2n\ H_2O$
Volume ratio $C_nH_{2n} : O_2$
$2 : 3n = 6 : 27$
$6 \times 3n = 27 \times 2$
$n = 3$

Hence, ***the alkene is C_3H_6***.

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CheeHock Chew
Author has **3.9K** answers and **3M** answer views · 1y

What volume of oxygen is required for complete burning of butane c4h10 to produce carbon dioxide and water?

Note:

The volume of 22.71 L was updated in the 1980s from 22.4 L when IUPAC changed the definition of STP to 1 bar (100 kPa or 0.986923 atm) instead of 1 atmosphere (101.3 kPa).

The balanced equation :

2C4H10 + 13O2 → 8CO2 + 10H2O

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Balanced equation:

2C2H2 + 5O2 → 4CO2 + 2H2O

So, 5 moles of oxygen are required for the complete combustion of 2 moles of ethyne.

Mole ratio of oxygen to ethyne = 5 : 2

At the same temperature and pressure, volume of a gas is directly proportional to number of moles.

Volume ratio of oxygen to ethyne = 5 : 2

Volume of oxygen needed = Volume of ethyne reacted x 5/2

= 7.65 cm^3 x 5/2

= 19.125 cm^3 (answer)

Upvote · 2

to produce carbon dioxide and water?

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Lives in Deeptisrinagar, Madinaguda, Hyderabad,9848685179 (2001–present) · Author has **4.1K** a… · 1y

C4H10 + 6.5 O2——→ 4CO2 + 5H2O

Volume of O2 required for complete combustion of 1 mole of C4H10 at STP = 6.5 × 22.4 = 145.6 litres

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combustion of 1 mole of carbon dioxide. What are the volumes of the products formed at the same temperature and pressure?

Robert M. Ellsworth
AB in History and Philosophy of Science, Princeton University (Graduated 1982) · Author has **4.5**… · 1y

Not a very illustrious beginning on Quora.

Carbon dioxide is a full combustion product (quadrivalent carbon and two oxygens) and it will not react any further with oxygen gas.

Related **What volume of oxygen is required for a complete combustion of 20**

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Les McLean
Ph.D. in Engineering · Author has **4.9K** answers and **12.7M** answer views · 8y

20cm^3 of CO is 0.02/22.4 = 8.929x10^-4 moles CO

10cm^3 of H2 is 0.01/22.4 = 4.464x10^-4 moles H2

For simplicity, call 10^-4 as Z

So the combustion equation is:

8.929ZCO(g) + 4.464ZH2(g) + 6.696ZO2(g) = 8.929ZCO2(g) + 4.464ZH2O(g)

This reaction occurs at 2200C, so

Change in Free Energy: ΔG(2200C) = -0..1117kJ (negative, so the reaction runs)

Change in Enthalpy: ΔH(2200C) = -0.3582kJ (negative, so the reaction is exothermic)

And, of course, 6.696Z moles of O2 is 6.696Z x 22.4 = 0.015L or 15cm^3

Interesting question – in the presence of the right catalyst, we could have made dimethyl ether:

2CO + 4H2 = C2H6O + H2O

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Trevor Hodgson
Knows English · Author has **11.9K** answers and **13.1M** answer views · 5y

The simplest way of doing these questions is to use the combined gas equation:

P1V1/T1 = P2V2/T2

Invariably there is a condition that remains constant - in your case temperature . This is common to both sides and can be eliminated: The equation then becomes

P1V1 = P2V2

Convert variables to the same units : 5 mL = 0.005 L

P1 * 0.005 L = 1 atm * 10 L

P1 = 1atm * 10 L / 0.005 L

P1 = 2,000 atm pressure required.

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Vasudevan A.N.S.
B.Sc- Chemistry - 1975 in Chemistry & Mathematics Simple Problems, University of Madras (Grad... · 5y

- ***Molecular Formula or Propane= C3H8***
- ***So C3H8 + 5O2 =====> 3 CO2 + 4H2O***
- ***Therefore 1- mole of Propane requires 5- moles of Oxygen for complete combustion.***
- ***Here number of moles and Volume are directly proportional.***
- ***So 1- Litre of Propane will require 5- litres of Oxygen at the same conditions of temperature and pressure.***

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Les McLean
Ph.D. in Engineering · Author has **4.9K** answers and **12.7M** answer views · 7y

The Old Thermodynamist says:

Say that "2 volumes" of acetylene is 22.4L, which is 1mol. Then the combustion reaction is:

$C_2H_2(g) + 2.5O_2(g) = 2CO_2(g) + H_2O(g)$ T = 3000C

Change in Free Energy: $\Delta G(3000C)$ = -906.3kJ (negative, so the reaction runs)

Change in Enthalpy: $\Delta H(3000C)$ = -1269.9kJ (negative, so the reaction is exothermic)

Then we need 2.5 times that amount of O_2, namely 56L or "5 volumes" of oxygen gas for complete combustion.

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Anil de Silva
Former Retired Civil Engineer (1980–2021) · Author has **511** answers and **294.9K** answer views · 3y

8g of oxygen is 0.25 moles and universal gas constant, R is

8.31446 joules/K/moles so the work done must be

0.25*(100+273)*8.31446*(-integration of dv/v from one to half) = 0.25*373*8.31446*ln2 joules

= 537.4 joules

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Tan Jared
Works at Singapore · Author has **336** answers and **1.6M** answer views · Updated 9y

1 mole of any gas will be 24dm3 at room temperature.

Ratio of C_2H_6 : CH_4 : Total Gas = 1 : 1 : 2 = 2 : 2 : 4

For a complete reaction to occur,

Ratio of C_2H_6 : O_2 = 2 : 7

Ratio of CH_4 : O_2 = 1 : 1 = 2 : 2

Overall ratio

C_2H_6 : CH_4 : Total Gas : O_2 = 2 : 2 : 4 : 2+7 = 2 : 2 : 4 : 9

There is 200cm3 of gas mixture.

Total Gas : O_2 = 4 : 9 = 200 : 450

Therefore, 450cm3 of oxygen is needed.

Answer: Option A.

Awanish Pratap Singh has alerted me here that the line "$CH_4 + O_2 \rightarrow CO_2 + H_2O$" in the question details is wrong. Assuming the corrected line "$CH_4 + 2O_2 \rightarrow CO_2 + H_2O$",

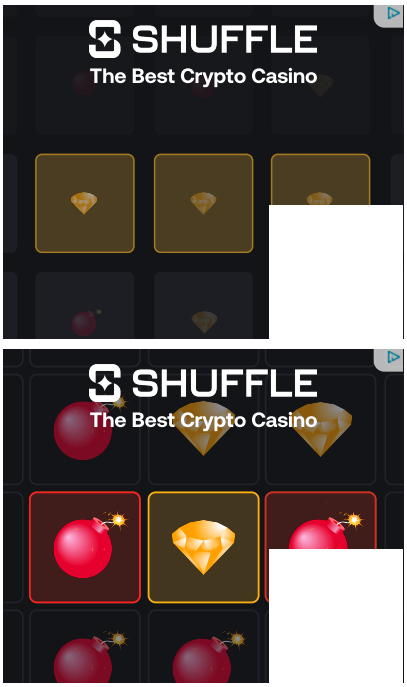
1 mole of any gas will be 24dm3 at room temperature.

Ratio of C_2H_6 : CH_4 : Total Gas = 1 : 1 : 2 = 2 : 2 : 4

For a complete reaction to occur,

Ratio of C_2H_6 : O_2 = 2 : 7

Ratio of CH_4 : O_2 = 1 : 2 = 2 : 4



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There is 200cm3 of gas mixture.

Total Gas : O2 = 4 : 11 = 200 : 550

Therefore, 550cm3 of oxygen is needed.

Answer: Option B.

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Trevor Hodgson
Former Project Manager (1975–2000) · Author has **11.9K** answers and **13.1M** answer vi… · Updated 4y

Balanced equation:

$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$

When dealing with gases we can use volumes in the equation

1 volume C_2H_4 reacts with 3 volumes O_2

10.0 L C_2H_4 reacts with 10.0 L*3 = 30.0 L O_2

Related **Air contains nearly 20% oxygen by volume. What is the volume of air**

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Chemistry tutor… at Self-Employment (2018–present) · Author has **29.8K** answers and **21.2M** answer views · 6y

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VOLUME expressed by the gas is proportional of the number of gaseous particles, i.e. the number of moles of gas... Capisce?

And as a preliminary we write the stoichiometric equation for the complete combustion of acetylene gas...

$$HC \equiv CH(g) + \frac{5}{2}O_2(g) \longrightarrow 2CO_2(g) + H_2O(l)$$

And thus ONE volume of acetylene, here $100 \bullet mL$, requires 2.5 volumes of dioxygen gas, i.e. $250 \bullet mL$. And to get this $250 \bullet mL$ volume we needs a

$$\frac{500 \bullet mL}{\frac{2}{5}} \text{ volume of air } = 1250 \bullet mL$$

with respect to the air...

What volume of carbon dioxide results from the reaction, given equivalent conditions? Take that atmosphere....

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Trevor Hodgson

Former Project Manager (1975–2000) · Author has **11.9K** answers and **13.1M** answer views · 6y

Balanced equation

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

1 cm^3 CH_4 reacts with 2 cm^3 O_2

5 cm^3 CH_4 will react with 2*5 = 10 cm^3 O_2

$C_2H_4 + 3\ O_2 \rightarrow 2CO_2 + 2H_2O$

1 cm^3 C_2H_4 reacts with 3 cm^3 O_2

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Ernest Leung
M.Phil. in Chemistry, The Chinese University of Hong Kong · Author has **13.1K** answers and **23.7M** answer views · 5y

Firstly, the units of pressure are kPa, but not Kpa.

Molar mass of C_2H_2 (acetylene) = (12.0×2 + 1.0×2) g/mol = 26.0 g/mol

Balanced equation for the burning of acetylene:
$2C_2H_2 + 5O_2 \rightarrow 4CO_2 + 2H_2O$
Mole ratio $C_2H_2 : O_2 = 2 : 5$

No. of moles of C_2H_2 burned = (42 g) / (26.0 g/mol) = 1.615 mol
No. of moles of O_2 needed = (1.615 mol) × (5/2) = 4.038 mol

Consider the O_2 needed:
Pressure, P = 103.2 kPa
Volume, V = ? L
No. of moles, n = 4.038 mol
Gas constant, R = 8.314 L kPa / (mol K)
Temperature, T = (273 + 12) K = 285 K

Gas law: PV = nRT
Then, V = nRT/P

Volume of O_2 needed, V = 4.038 × 8.314 × 285 / 103.2 L = 92.7 L

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Trevor Hodgson
Knows English · Author has **11.9K** answers and **13.1M** answer views · 5y

Write a balanced equation:

$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$

1 volume + 3 volumes = 2 volumes + 2 volumes .

4 volumes reactants = 4 volumes products.

Now - if the reaction products are allowed to cool down to STP , and all volume measurements are taken at STP - then the volume of water produced can be ignored and there will be a 50% reduction in volume

But if the reactants are kept at 105°C before ignition and the products also cooled to 105°C after ignition - and all volumes are measured at this temperature , then there will be no change in volume

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Dennis Leppin
B.E.and M.E. in Chemical Engineering, City College of New York · Author has **2.3K** answers and **1.…** · 7y

At the same temperature and pressure as the 10 liters of hydrogen is referred to, also 10 liters. If the T and P were such that liquid water was present at equilibrium, then we need to know the T and P to decide the volume of the two phase mixture. You of course need 1/2 mole of oxygen for each mole of hydrogen, so considering as ideal gases, you need 5 liters of oxygen.

Upvote · 2

Les McLean
Ph.D. in Engineering · Author has **4.9K** answers and **12.7M** answer views · 8y

10cm^3 of CO is 10Cm^3/22.4L = 10/22400 = 4.464x10^-4 mol

Similarly, 15cm^3 of H2 is 15/22400 = 6.696x10^-4 mol

So the reaction is

4.464x10^-4 CO + 6.696x10^-4 H2 + (2.232 + 3.3488)x10^-4 mol O2

This is 5.58x10^-4 mol O2 x 22400 = 12.499cm^3 O2 (say 12.5cm^3)

Related questions

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